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225. Proposed by H. M. ARMSTRONG, Cooch's Bridge, Delaware.

If $a = ax + cy + bz \dots\dots (1)$, $\beta = cx + by + az \dots\dots (2)$, $\gamma = bx + ay + cz \dots\dots (3)$, show that $a^3 + \beta^3 + \gamma^3 - 3a\beta\gamma = (a^3 + b^3 + c^3 - 3abc)(x^3 + y^3 + z^3 - 3xyz)$.

GEOMETRY.

248. Proposed by CHRISTIAN HORNING, Heidelberg University, Tiffin, Ohio.

Given AB, BC in a straight line, to produce it to D so that $AD \cdot CD = BD^2$.

249. Proposed by W. W. BEMAN, The University of Michigan.

Given the distances of a point in the plane of a square from three of its vertices, to find the side of the square.

250. Proposed by W. W. BEMAN, The University of Michigan.

Given the distances of a point in the plane of an equilateral triangle from the vertices; to find the side of triangle. [Perkins' *Geometry*, Olney's *Geometry*.]

CALCULUS.

189. Proposed by J. E. SANDERS, Hackney, Ohio.

Solve $d^2y/dx^2 = -\beta^2(p+y)$, p and β being constants. The initial conditions are $y=0$ for $x=0$, l ; $dy/dx=0$ for $x=l/2$. [Merriman's *Mechanics*, 9th Ed., 1903, §62.]

190. Proposed by SAUL EPSTEIN, The University of Chicago, Chicago, Ill.

$$\int_0^\infty \frac{\sin x \cos \beta x}{x} dx, \int_0^\infty \frac{\sin x x \cos x}{x}.$$

MECHANICS.

170. Proposed by M. E. GRÄBER, A. M., Heidelberg University, Tiffin, Ohio.

Prove that the moment of inertia of an ogival head rotating about its geometrical axis is $\frac{\pi w}{g} \int_0^{R/(4n-1)} y^4 dx$, where w is the weight in pounds of a cubic foot of material, R the radius of the base of the ogive, and n the diameter of projectile.

DIOPHANTINE ANALYSIS.

123. Proposed by L. E. DICKSON, Ph. D., The University of Chicago.

Of two numbers $a_i b_i c_i d_i e_i$ ($i=1, 2$) it is given that their 10 digits a_1, \dots, e_2 form a permutation of 0, 1, ..., 9, and that the sum of the two is $x8951$. Give an immediate evaluation of x ; also list the possible pairs $a_1, a_2; \dots; e_1, e_2$.